**Lighthouse**

**Target audience**: grades 4-8

**Class time:** Class will meet 2 days per week for 6 weeks, then 9 consecutive days for a total of 21 class hours offered. Inquiry project options will be derived from the materials/ topics explored in class.

**Class Overview:** Students will be conducting labs and establishing background knowledge around the topics of sustainability and agriculture.

**Standards/ Benchmarks to be addressed:**

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| 2. The Practice of Engineering: | Recognize that there is no perfect design and that new technologies have consequences that may increase some risks and decrease others. |  |
| 3. Interactions Among Science, Technology, Engineering, Mathematics and Society | Describe a system in terms of its subsystems and parts, as well as its inputs, processes and outputs. |  |
| 1. The Practice of Science: | Generate and refine a variety of scientific questions and match them with appropriate methods of investigation, such as field studies, controlled experiments, review of existing work, and development of models. |  |
|  | Plan and conduct a controlled experiment to test a hypothesis about a relationship between two variables, ensuring that one variable is systematically manipulated, the other is measured and recorded, and any other variables are kept the same (controlled). For example: The effect of various factors on the production of carbon dioxide by plants. |  |
| The Practice of Science: | Evaluate explanations proposed by others by examining and comparing evidence, identifying faulty reasoning, and suggesting alternative explanations. |  |
| Interactions Among Science, Technology, Engineering, Mathematics and Society: | Use maps, satellite images and other data sets to describe patterns and make predictions about natural systems in a life science context. For example: Use online data sets to compare wildlife populations or water quality in regions of Minnesota. |  |
|  | Determine and use appropriate safety procedures, tools, measurements, graphs and mathematical analyses to describe and investigate natural and designed systems in a life science context. |  |

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| 1. Structure and Function of Living Systems | 1. Tissues, organs and organ systems are composed of cells and function to serve the needs of all cells for food, air and waste removal. | 7.4.1.1.1 | Recognize that all cells do not look alike and that specialized cells in multicellular organisms are organized into tissues and organs that perform specialized functions. *For example*: Nerve cells and skin cells do not look the same because they are part of different organs and have different functions. |  |
|  |  | 7.4.1.2.1 | Recognize that cells carry out life functions, and that these functions are carried out in a similar way in all organisms, including, animals, plants, fungi, bacteria and protists. |  |
|  |  | 7.4.1.2.2 | Recognize that cells repeatedly divide to make more cells for growth and repair. |  |
|  |  | 7.4.1.2.3 | Use the presence of the cell wall and chloroplasts to distinguish between plant and animal cells. *For example:* Compare microscopic views of plant cells and animal cells. |  |
| 2. Interdepen-dence Among Living Systems | 1. Natural systems include a variety of organisms that interact with one another in several ways. | 7.4.2.1.1 | Identify a variety of populations and communities in an ecosystem and describe the relationships among the populations and communities in a stable ecosystem. |  |
|  |  | 7.4.2.1.2 | Compare and contrast the roles of organisms within the following relationships: predator/prey, parasite/host, and producer/consumer/decomposer. |  |
|  |  | 7.4.2.1.3 | Explain how the number of populations an ecosystem can support depends on the biotic resources available as well as abiotic factors such as amount of light and water, temperature range and soil composition. |  |
|  |  | 7.4.2.2.1 | Recognize that producers use the energy from sunlight to make sugars from carbon dioxide and water through a process called photosynthesis. This food can be used immediately, stored for later use, or used by other organisms. |  |
|  |  | 7.4.2.2.2 | Describe the roles and relationships among producers, consumers, and decomposers in changing energy from one form to another in a food web within an ecosystem. |  |
|  |  | 7.4.2.2.3 | Explain that the total amount of matter in an ecosystem remains the same as it is transferred between organisms and their physical environment, even though its form and location change. *For example:* Construct a food web to trace the flow of matter in an ecosystem. |  |
| 3. Evolution in Living Systems | 1. Reproduction is a characteristic of all organisms and is essential for the continuation of a species. Hereditary information is contained in genes which are inherited through asexual or sexual reproduction. | 7.4.3.2.3 | Recognize that variation exists in every population and describe how a variation can help or hinder an organism’s ability to survive. |  |
|  |  | 7.4.4.1.1 | Describe examples where selective breeding has resulted in new varieties of cultivated plants and particular traits in domesticated animals. |  |
|  |  | 7.4.4.1.2 | Describe ways that human activities can change the populations and communities in an ecosystem. |  |
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**BIG PICTURE**

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| **Enduring Understandings** | **Essential Questions** | **Learning Targets** | **Experiences** |
| Inquiry begins with observations;  observations lead to questions;  questions lead to research;  research leads to universally  accepted theories and laws or new  ideas and new questions. | How do we learn new things? How  do we answer a question?  How do we represent data? How  do we use data? | * Conduct biological experiments using scientific equipment to acquire data * Collect, calculate and analyze data * Use equipment to collect and analyze data to accept or reject hypotheses * Recommend a further study * Recall historical examples of how scientific ideas have changed through new discoveries |  |
| Patterns are observed, explored,  identified and are used to make  predictions. | Why are patterns useful? What do  patterns tell us? | * Predict outcomes based on hypotheses * Describe the future impact of human use of natural resources (renewable/non-renewable, plastics) |  |
| Classification is based on common  characteristics which aid in  understanding relationships | What does it mean to be similar?  What does it mean to be different? | * Classify the diversity of life using biological characteristics * Relate uses of materials to their chemical and physical properties |  |
| Cycles can be found in systems,  living and non-living. | How are things used and reused? | * Analyze the role of water in maintaining life * Describe and explain, using words or formulas, the cycling of matter and flow of energy through an ecosystem’s components, for example photosynthesis and geochemical cycles. |  |
| Systems have components for  specific functions that allow the  system to exist. | How is the sum greater than its  parts?  How do parts make the whole work? | * Analyze the importance of each component of the atmosphere to plant and animal life. * Determine the relationship between the function and structure of cells |  |
| Systems interact and influence  each other. | • What are the effects of multiple  relationships?  • How does a system that builds react to changes?   * How do humans impact the world? | * Diagram multiple ways organisms are interdependent within an ecosystem * Identify responses to stimuli for example, types of behavior, diffusion / osmosis * Give examples of how resources are used to produce energy, make products, provide food and shelter, and improve quality of life. * Predict the effects on animal and plant life of industrial and agricultural activities that produce different types of pollutants. * Propose solutions to problems resulting from obtaining and using natural resources. |  |
| Systems react to change by seeking  stability | Why do things stay the same?  Why do things become different? | Analyze interactions of matter on a micro and macro scale |  |